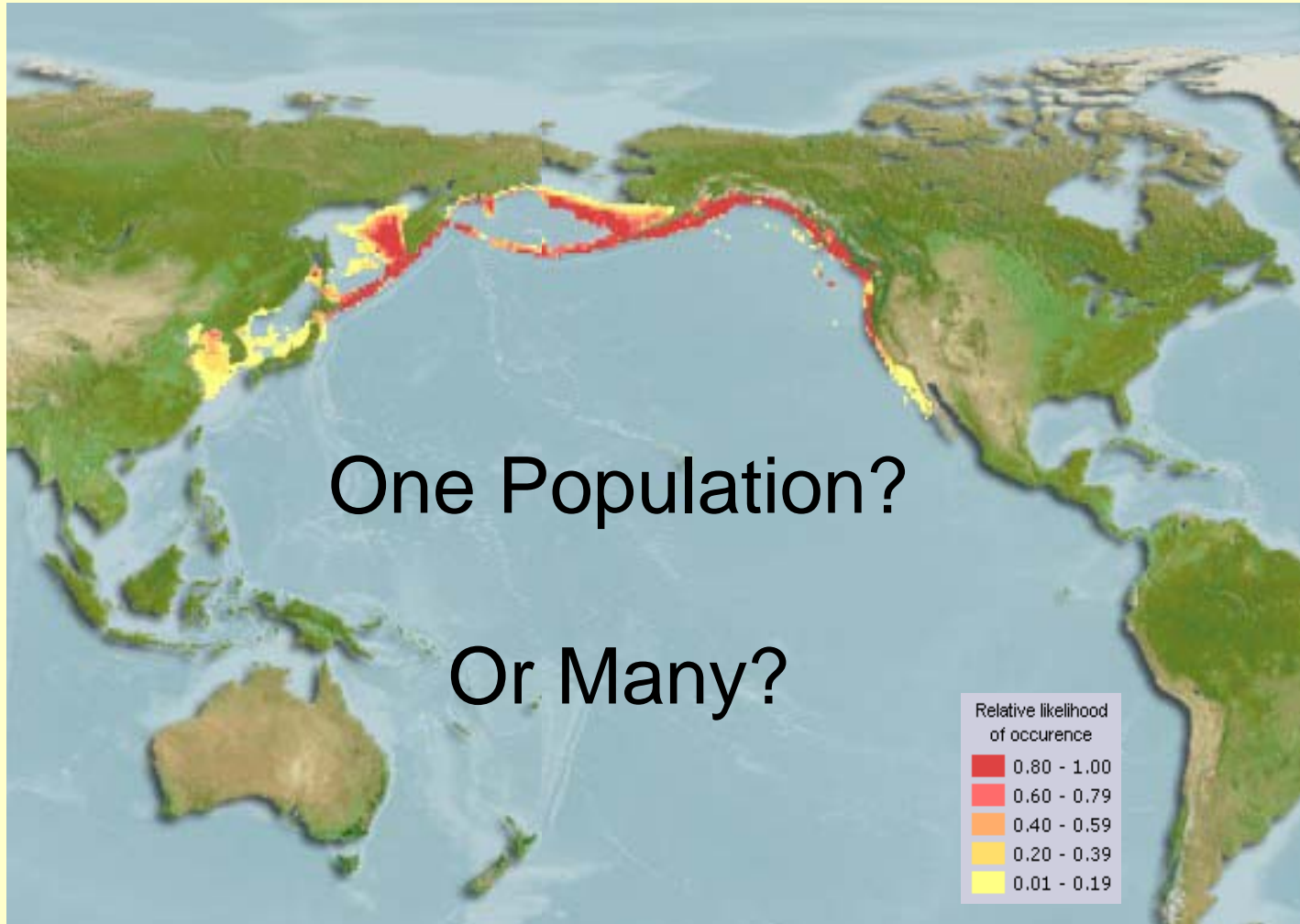


Pacific Lamprey





What Is the Evidence?

More Than One Population:

Anadromous adults return to streams where lamprey historically occurred (homing?)

Significant allozyme differences between lamprey from Vancouver Is and Fraser River

Significant msat DNA differences between lamprey in Columbia River

- Beamish & Withler (1986)
- Scribner et al. (unpublished)

One Population:

Sea lamprey do not home. Spawning locations chosen by olfactory cues; mechanism also occurs in Pacific lamprey

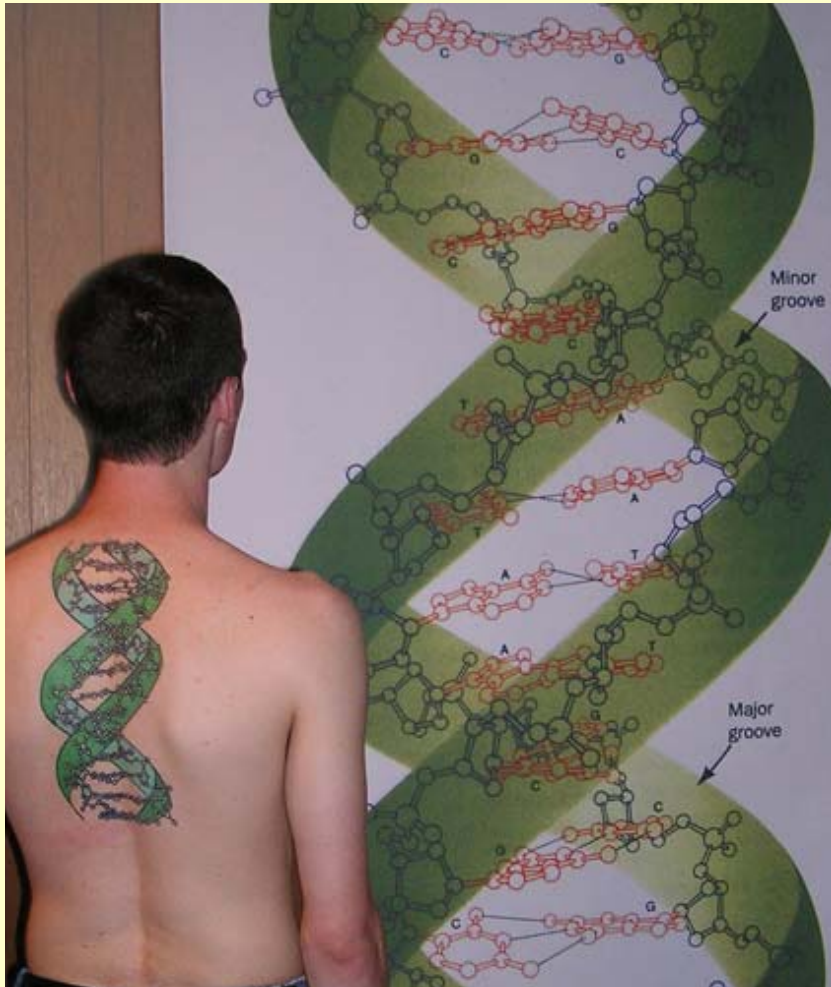
But...

No mtDNA differences among lamprey from Vancouver Is, BC, WA, OR, CA coast

But...

- Docker et al. (1999)
- Goodman (2006)

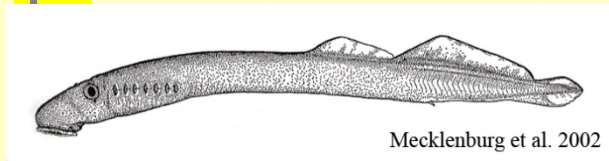
Pondering the Solution...



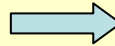
Amplified Fragment Length Polymorphisms (AFLP)

- + No previous molecular information required
- + Large number of polymorphic loci with shared alleles
- + Low cost/locus
- Dominant marker

AFLP Analysis

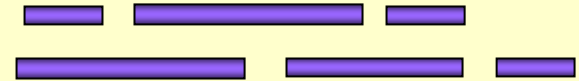
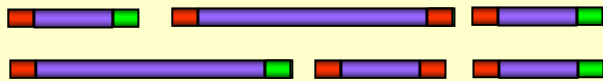


Extract DNA



Add adaptors to create PCR binding sites

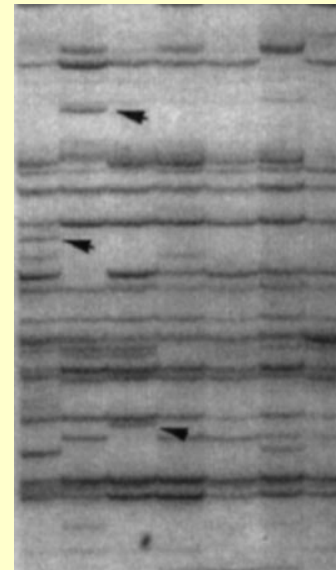
Digest with *Eco* RI & *Mse* I



Selective amplification with PCR

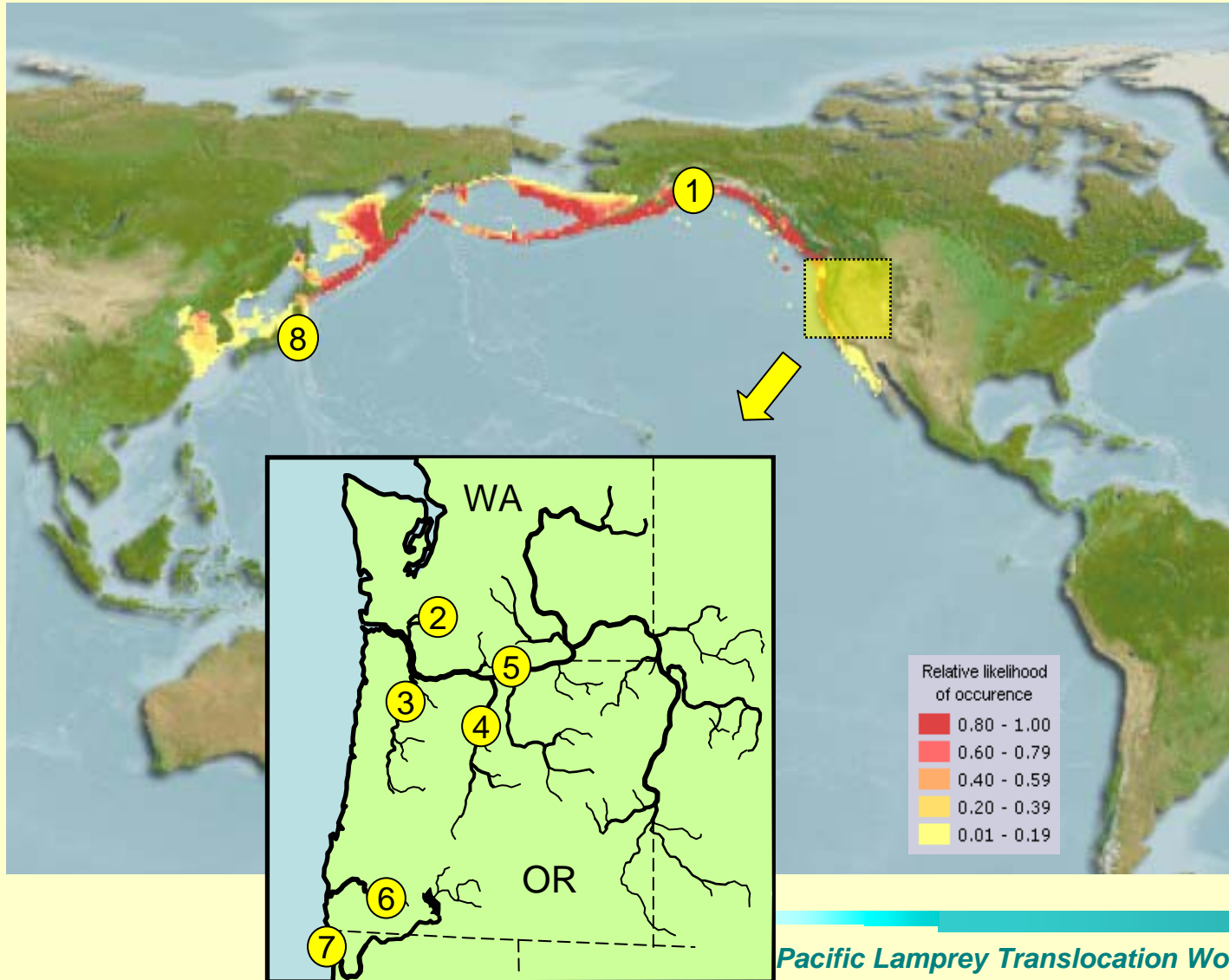


Electrophoresis



Look for differences in banding patterns

Collection of Pacific Lamprey

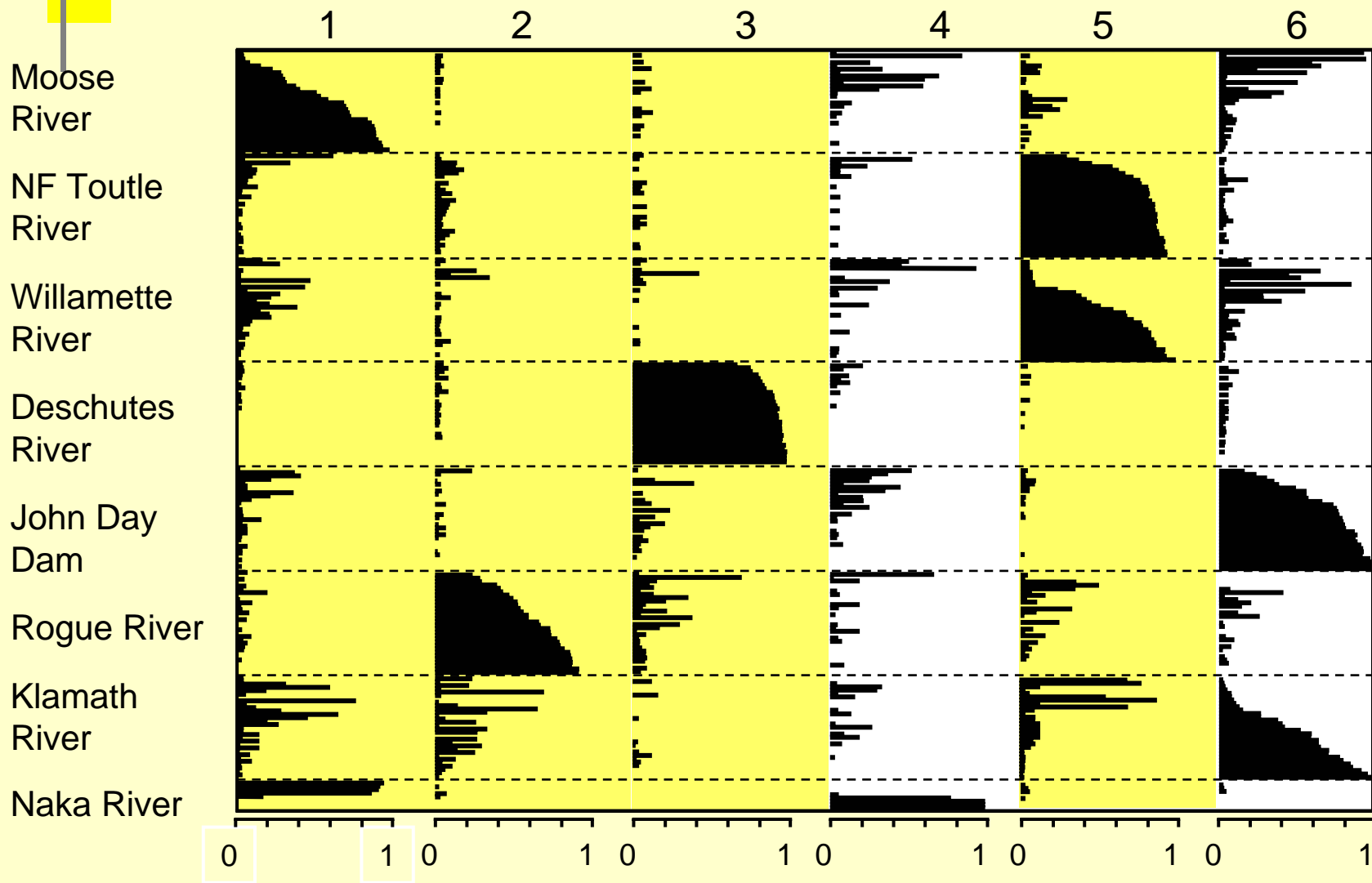




What Did We Find?

- Genetic differences exist among Pacific lamprey from different regions and streams

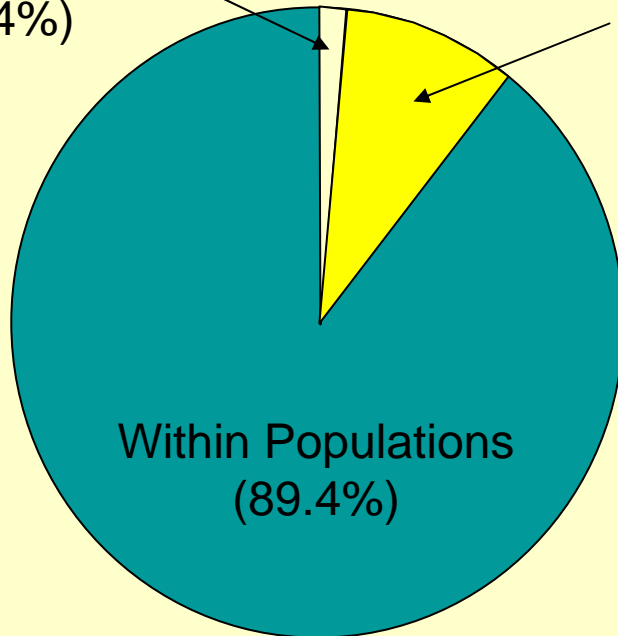
Assignment to Hypothetical Populations



Likelihood

Where Did the Genetic Differences Occur?

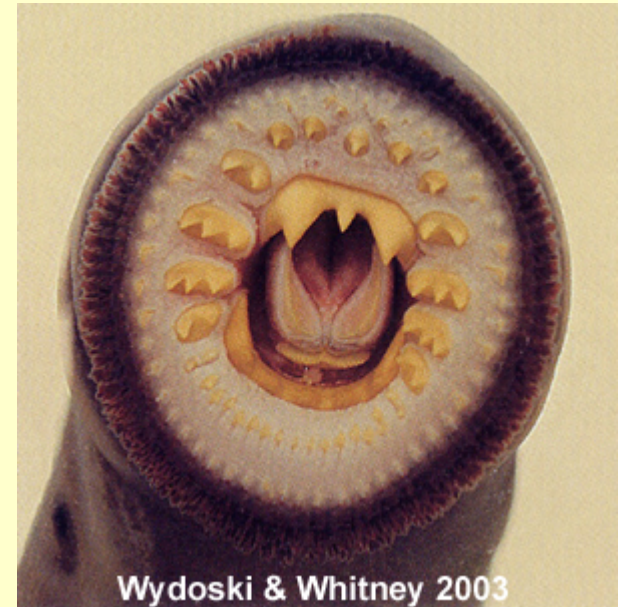
Among
Regions
(1.4%)

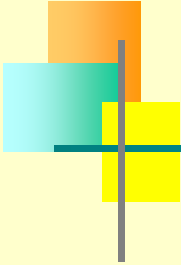


Among
Populations
within Regions
(9.2%)

Within Populations
(89.4%)

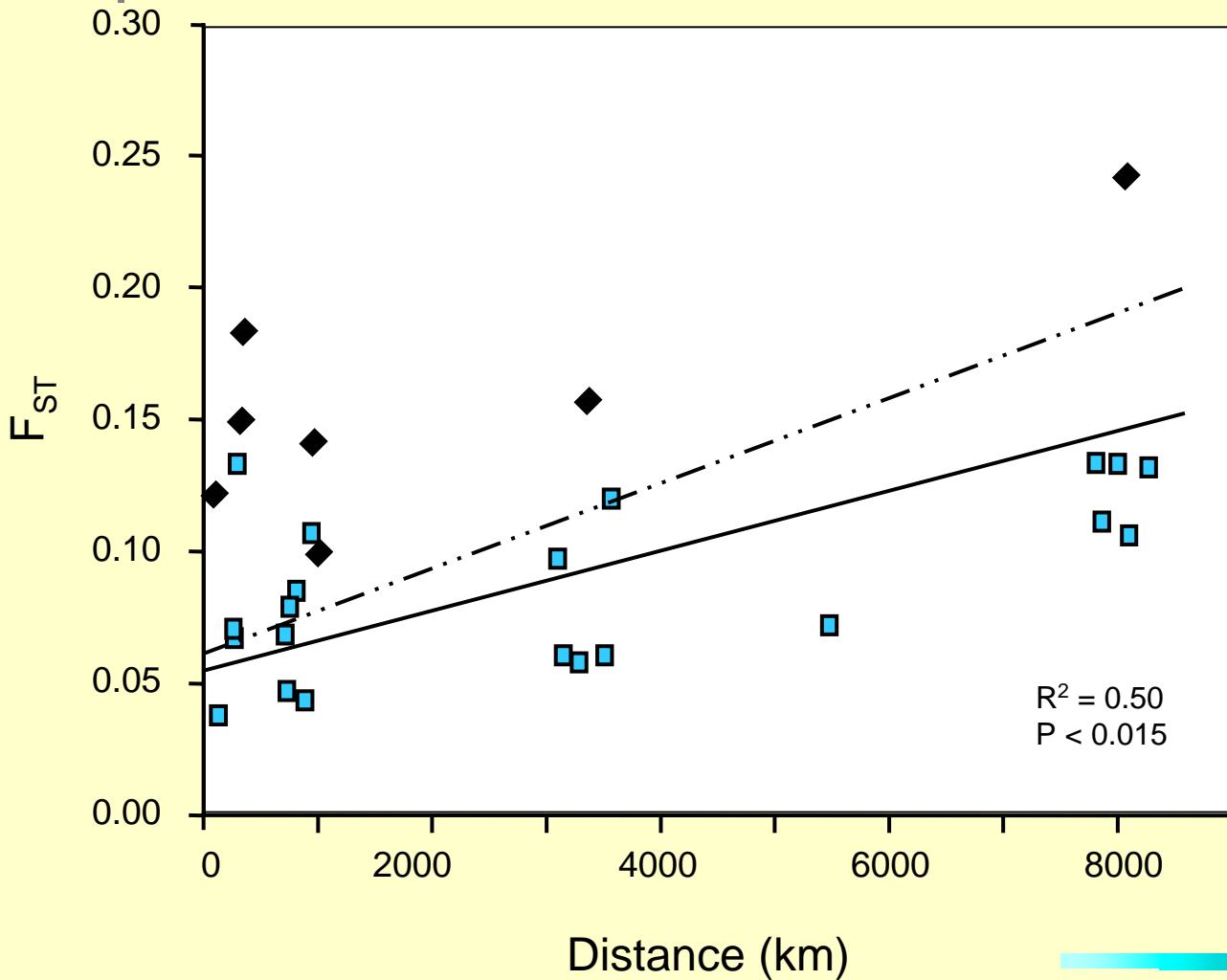
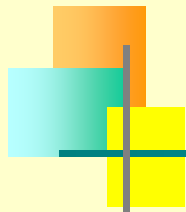
All comparisons significant
($P < 0.001$)





What Did We Find?

- Genetic differences exist among Pacific lamprey from different regions and streams
- Across their range, Pacific lamprey show evidence of isolation by distance



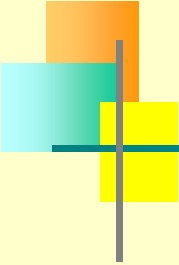
Genetic Exchange (Nm)

Japan - PNW ~ 2

Alaska - PNW ~ 3

Within PNW 1 - 7

◆ = Deschutes

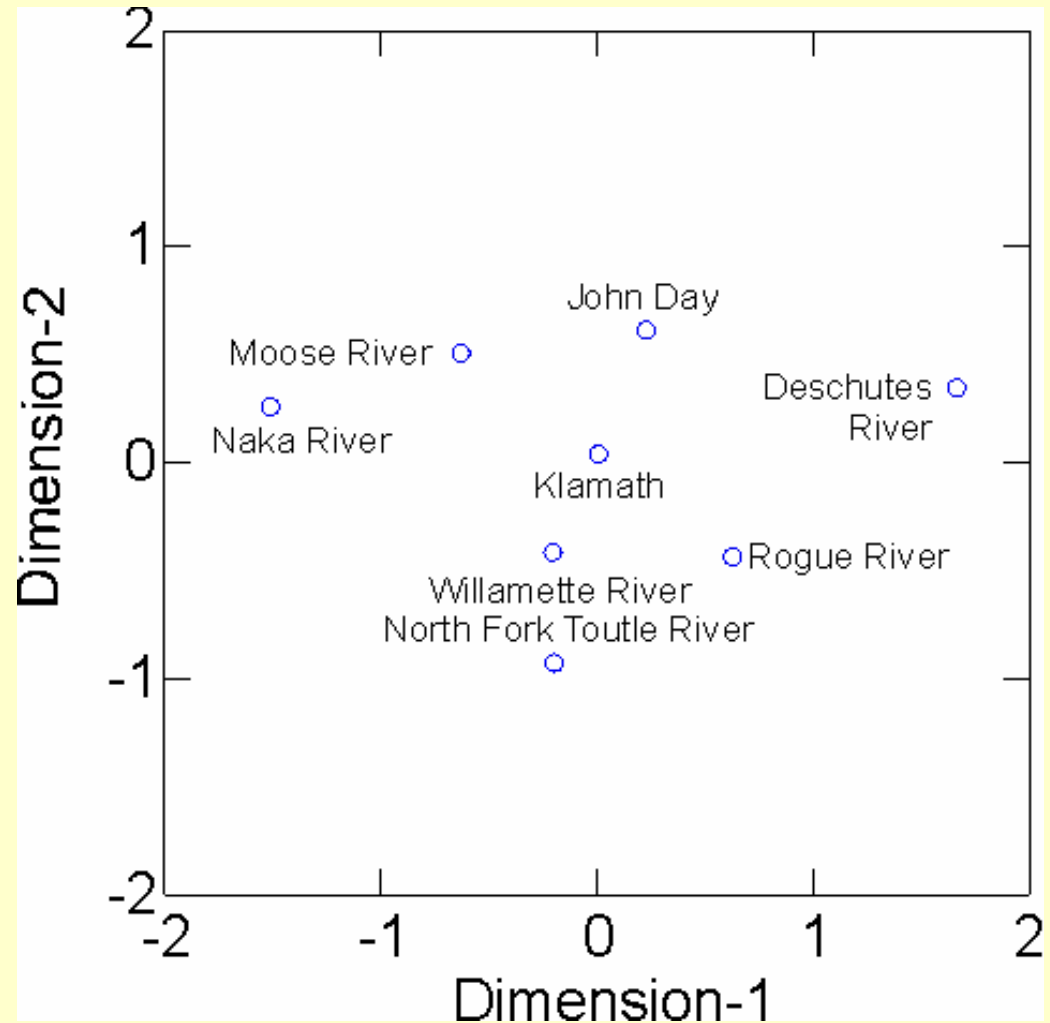


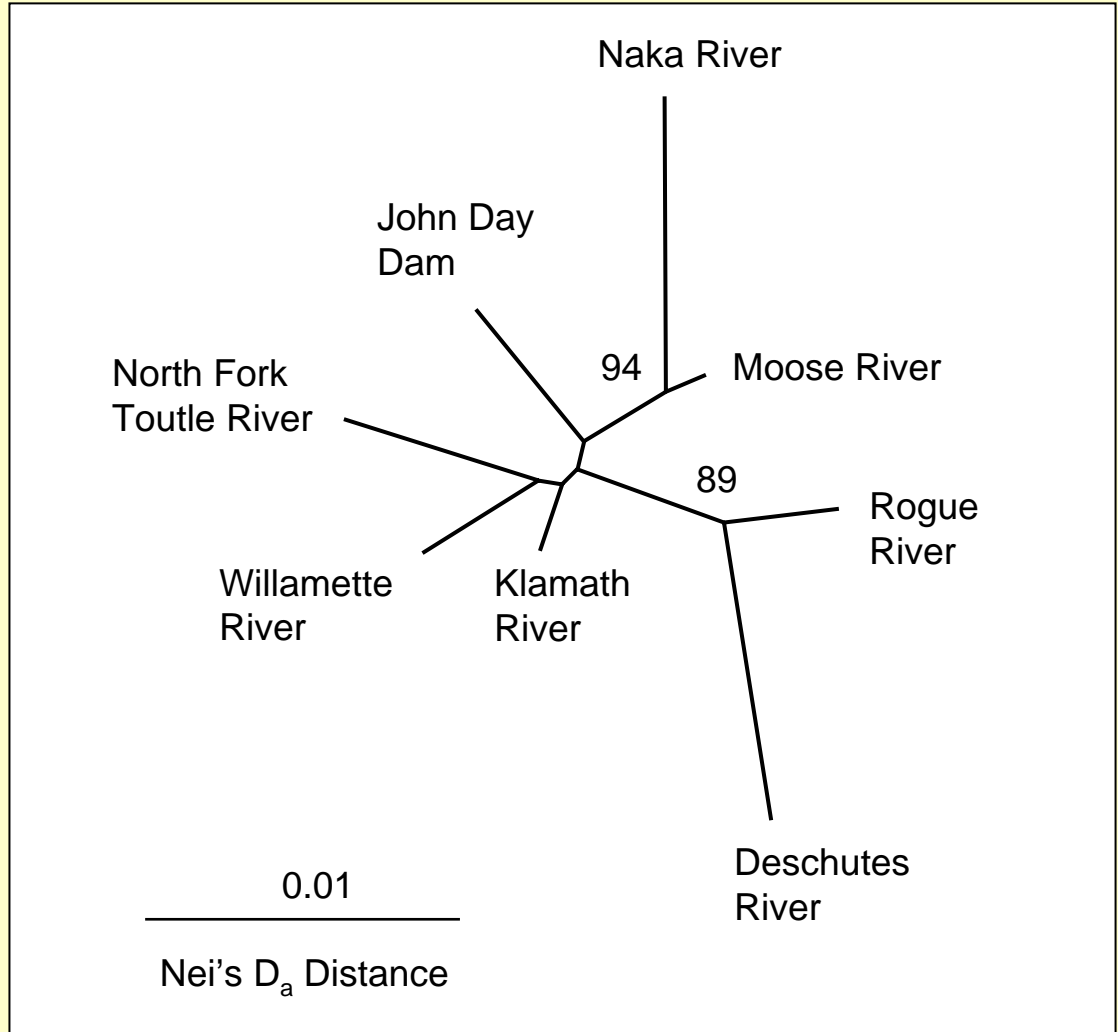
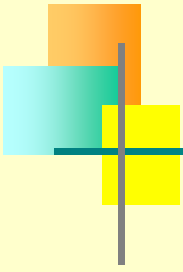
What Did We Find?

- Genetic differences exist among Pacific lamprey from different regions and streams
- Across their range, Pacific lamprey show evidence of isolation by distance
- Significant differences occurred among aggregations in the Pacific Northwest but with no apparent strong geographical pattern

1-Fst MDS plot

- Pairwise FST range (0.037 – 0.182)
- All comparisons significant ($P < 0.001$)





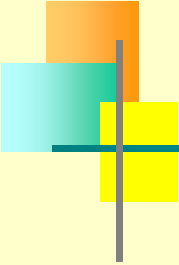
Why?

- Why are these results different from Goodman (2006)?



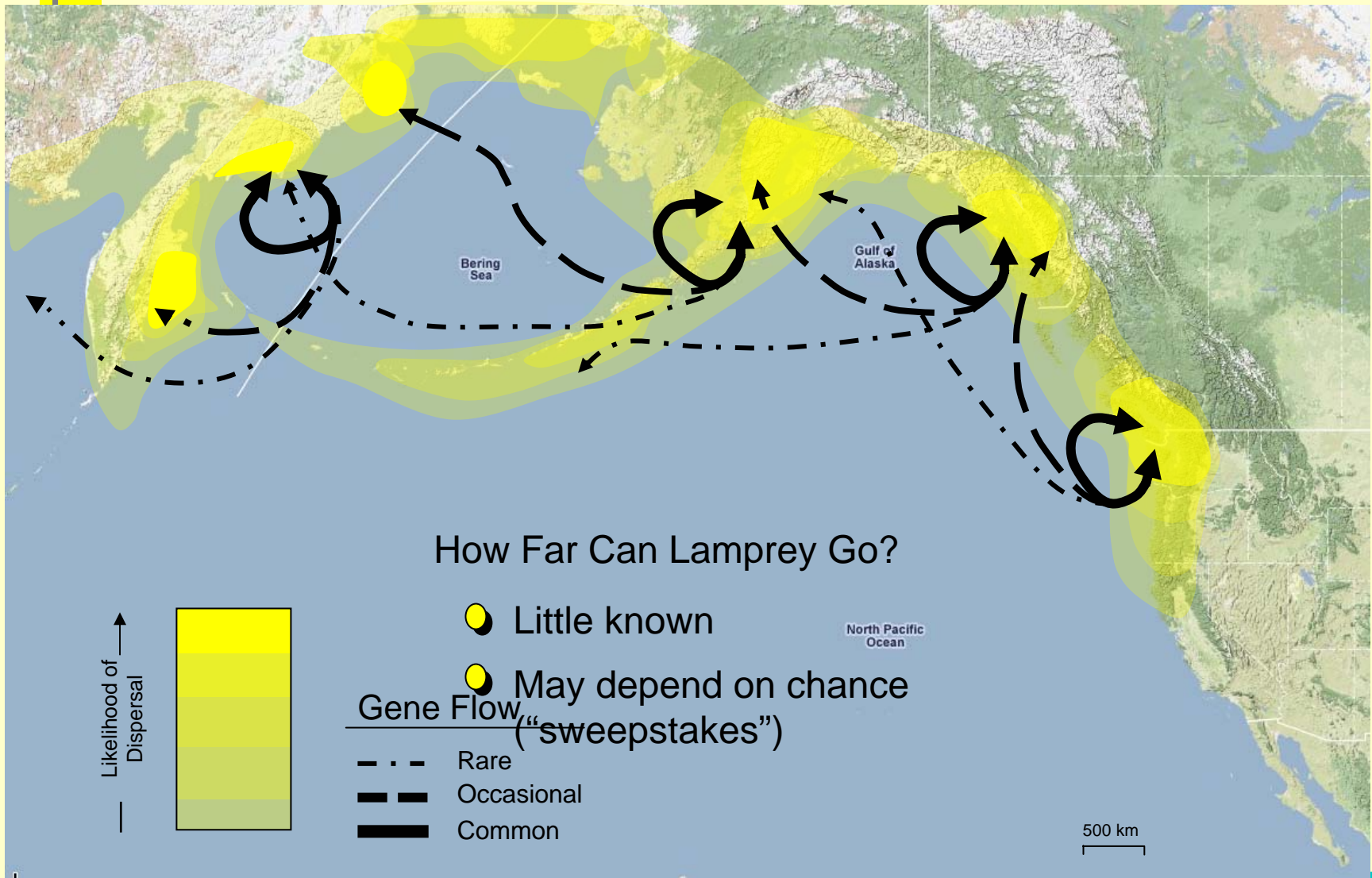
- What might explain the patterns we observed?



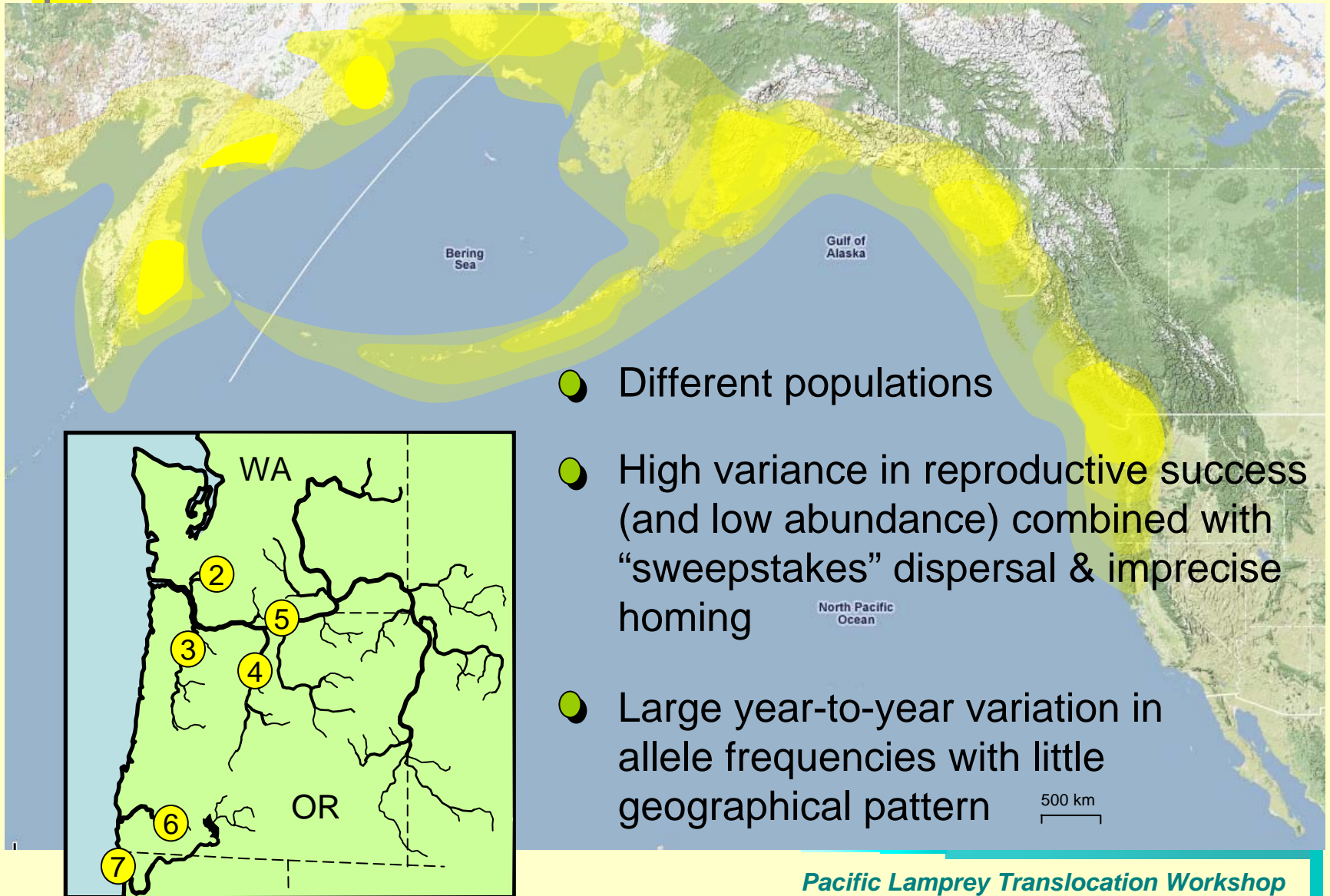


Why?

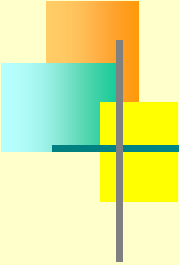
- Power – 1 locus (mtDNA) versus 180 loci (AFLP)
 - ammocoetes versus adults
- Female mediated gene flow
- Interaction of different life-history traits:
 - “Sweepstakes” ocean dispersal
 - Imprecise homing
 - High variance in reproductive success (common for highly fecund species)



Differences within the Pacific Northwest?



- Different populations
- High variance in reproductive success (and low abundance) combined with “sweepstakes” dispersal & imprecise homing
- Large year-to-year variation in allele frequencies with little geographical pattern



Conclusions

- Pacific lamprey are not panmictic
- Large genetic differences between aggregations in different streams may indicate different populations or year-to-year variation
- Useful to develop suites of Pacific lamprey specific microsatellite or other DNA markers (10-20 loci)
- Understanding the ocean-phase of the Pacific lamprey life history is critically important



Thank You

BINBIN LIN,

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Adrian Spidle, Yuji Yamazaki,

and David Close

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